课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	**课程名称 Course Title**	**结构力学 I Structural Mechanics I**
2.	**授课院系 Originating Department**	海洋科学与工程系 Department of Ocean Science and Engineering
3.	**课程编号 Course Code**	OCE 322
4.	**课程学分 Credit Value**	3
5.	**课程类别 Course Type**	专业基础课 Major Foundational Courses
6.	**授课学期 Semester**	秋季 Fall
7.	**授课语言 Teaching Language**	中英双语 English & Chinese
8.	**授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师） Instructor(s), Affiliation& Contact （For team teaching, please list all instructors）**	侯超 海洋科学与工程系 工学院南楼 206 0755-88015270 Dr. Chao Hou, Department of Ocean Sciences and Engineering Room 206, South Tower, College of Engineering, 0755-88015270
9.	**实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact**	无 NA
10.	**选课人数限额(可不填) Maximum Enrolment （Optional）**	

11.	授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other（Please specify）	总学时 Total
	学时数 Credit Hours	48				48
12.	先修课程、其它学习要求 Pre-requisites or Other Academic Requirements					
13.	后续课程、其它学习规划 Courses for which this course is a pre-requisite					
14.	其它要求修读本课程的学系 Cross-listing Dept.					

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

通过本课程的教学，使学生了解基本结构体系的组成规律，提高结构分析能力，为毕业后从事结构设计、施工和科研工作打好理论基础，培养学生对工程结构进行分析和计算的能力。

Through the learning of this course, students can enhance the understanding on the composition of fundamental structural system and improve the structural analysis ability. This course helps students lay a foundation for ocean science and engineering related study in the future, and builds up students' ability to provide rational analysis and design for common engineering structures.

16. 预达学习成果 Learning Outcomes

通过本课程的学习，学生将掌握以下内容：结构力学的基本理论，静定结构分析，基本方法-刚度法、弯矩分配法、梁理论，海洋结构中杆及杆系的分析、杆件稳定性问题。

By taking this course, students can obtain the following knowledge and skills：Basic theories of structural mechanics; Analysis of static structures; Stiffness method; Moment-area method; The classic beam theory; Truss analysis; Structural stability of columns.

17. 课程内容及教学日历 （如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人）
Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

Section 1　　课程与学科介绍：结构力学的内容、发展、应用与重要性 （2 学时）

Introduction: the scope, development, applications and significance of structural mechanics (2 hours)

Section 2　　课程基础知识串联（3 学时）

Fundamental knowledge of functions, matrix algebra, mechanics of solids, etc. (3 hours)

Section 3　　静定结构理论（5 学时）

静定结构判定；静定结构的支座反力与内力计算；利用节点法或截面法求解静定桁架结构。

Statics of structures (5 hours)

Determination of the statically determinacy of a given structure. Calculation of the support reactions and internal forces of a statically determinate structure. Analysis of statically determinate trusses using method of joints and method of sections

Section 4 刚度法-桁架结构（4 学时）

超静定桁架结构介绍；利用刚度法求解桁架结构，包括刚度法简介、桁架结构刚度矩阵的推导、求解过程及结果分析。

Stiffness method for truss structures (4 hours)

Introduction to indeterminate trusses. Truss analysis using the stiffness method, including the introduction to stiffness method, the derivation of stiffness matrix for a truss, the solution procedure and the post-processing, etc.

Section 5 刚度法-梁结构（4 学时）

利用刚度法求解梁结构，包括梁单元特性学习以及对梁构件受力的分析方法等。

Stiffness method for beam structures: (4 hours)

Beam analysis using the stiffness method, including the introduction to beam element and the consideration of member loading, etc.

Section 6 刚度法-框架结构（3 学时）

利用刚度法求解框架结构，包括框架单元特性学习以及相应的结构求解方法。

Stiffness method for frame structures: (3 hours)

Frame analysis using the stiffness method, including the introduction to frame element and the corresponding solution procedure.

Section 7 弯矩分配法（3 学时）

弯矩分配法讲解；利用弯矩分配法求解连续梁；利用弯矩分配法求解框架结构。

Moment distribution method: (3 hours)

Introduction to the method of analysis usually referred to as moment distribution; Moment distribution method for continuous beams; Moment distribution method for frames.

Section 8 欧拉-伯努利梁理论（7 学时）

经典欧拉-伯努利梁理论及其假定；结构控制方程；二重积分法；弯矩、剪力与梁杆件受力的关系规律分析。

Beam theory: Euler-Bernoulli beam model (7 hours)

Introduction to the assumption of Euler-Bernoulli beam model; Derivation of governing differential equations; Method of double integration; Relationship between bending moment, shear force and member loading.

Section 9 图乘法与共轭梁理论（5 学时）

图乘法基本理论与应用；共轭梁法基本理论与应用；两种经典的结构求解方法的对比分析。

Moment-area method and Conjugate beam method: (5 hours)

The basic principles and applications of moment-area method; The basic principles and applications of conjugate beam method; Comparison between these two classic methods for structural analysis.

Section 10　　柱稳定性分析（4 学时）

结构失稳概念介绍；柱构件屈曲分析所需的假定；临界荷载与屈曲强度计算。

Introduction to the structural stability of columns: (4 hours)

Introduction to the concept of instability; Evaluation of the assumptions required for the buckling analysis of a column; Critical load of a column; Method for buckling strength prediction.

Section 11　　非线性分析简介（2 学时）

典型结构非线性问题的简介；材料非线性分析示例。

Introduction to nonlinear analysis: (2 hours)

Introduction to the common cases of nonlinearity in structures; worked example on nonlinear material properties

Section 12　　结构力学在现代工程建设中的应用（2 学时）

结合工程实例，浅析结构力学在现代工程建设中的应用。

The application of structural mechanics in advanced design and constructions: (2 hours)

Investigation of the application of structural mechanics in advanced engineering industry through case studies on a number of large infrastructure construction practices.

Section 13　　课程展示与讨论（2 学时）

学生将从一系列备选主题中自选题目，进行思考、展示与课堂讨论。

In-class presentation and debate: (2 hours)

Students are encouraged to present and debate on a list of choses topics related to the content learnt in this course.

Section 14　　课程总结与串联（2 学时）

梳理课程内容；绘制知识图谱；复习与串联。

Review of the course: (2 hours)

Review of the topics covered in this course; Knowledge map; Revision and reflection.

18.　教材及其它参考资料 Textbook and Supplementary Readings

参考资料：

1. Gianluca Ranzi & Raymond Ian Gilbert, Structural Analysis: Principles, Methods and Modelling. CRC Press, Taylor & Francis Group, 2015.
2. 龙驭球，包世华，袁驷. 《结构力学 I——基础教程》，高等教育出版社.
3. 龙驭球，包世华，袁驷. 《结构力学 II——专题教程》，高等教育出版社.

课程评估 ASSESSMENT

19.

评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance		10		
课堂表现 Class Performance		10		
小测验 Quiz				
课程项目 Projects		20		
平时作业 Assignments		20		
期中考试 Mid-Term Test				
期末考试 Final Exam		40		
期末报告 Final Presentation				
其它（可根据需要改写以上评估方式） Others (The above may be modified as necessary)				

20. 记分方式 GRADING SYSTEM

☑ A. 十三级等级制 Letter Grading
☐ B. 二级记分制（通过/不通过） Pass/Fail Grading

课程审批 REVIEW AND APPROVAL

21. 本课程设置已经过以下责任人/委员会审议通过
This Course has been approved by the following person or committee of authority

海洋科学与工程系本科教学委员会
Department of Ocean Science and Engineering Undergraduate Committee